

JC10 Rec'd PCT/PTO 28 DEC 2001

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. § 371		Attorney's Docket Number 041463-5030
International Application. No.	International Filing Date	U.S. Application No. Unassigned
PCT/CH00/00279	May 19, 2000	Priority Date Claimed June 29, 1999

Title of Invention: **APPARATUS FOR GENERATING ELECTRICAL ENERGY**

Applicant For EO/EO/US: Othmar BRUHWILER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. § 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. § 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. § 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. § 371(b) and PCT Articles 22 and 39(I).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. § 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. § 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. § 371(c)(3)).
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. § 371(c)(3)).
9. ☐ An oath or declaration of the inventors (35 U.S.C. § 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. § 371(c)(5)).

**Items 11. to 14. below concern other document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 C.F.R. § 1.97 and § 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. § 3.28 and § 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☒ Other items or information:

U.S. APPLICATION NO. | INTERNATIONAL APPLICATION NO. | ATTORNEY DOCKET NUMBER  
 Unassigned | PCT/CH00/00279 | 041463-5030

15. ☒ The following fees are submitted:

**Basic National Fee (37 C.F.R. § 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO.....\$890.00

International preliminary examination fee paid to

USPTO (37 C.F.R. § 1.482).....\$710.00

No international preliminary examination fee paid to

USPTO (37 C.F.R. § 1.482) but international search fee

paid to USPTO (37 C.F.R. § 1.445(a)(2)).....\$740.00

Neither international preliminary examination fee

(37 C.F.R. § 1.482) nor international search fee

(37 C.F.R. § 1.445(a)(2)) paid to USPTO.....\$1,040.00

International preliminary examination fee paid to USPTO

(37 C.F.R. § 1.482) and all claims satisfied provisions

of PCT Article 33(2)-(4).....\$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =** \$890.00

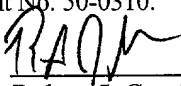
Surcharge of \$130.00 for furnishing the oath or declaration later than

☐ 20 ☒ 30 months from the earliest claimed priority date

(37 C.F.R. § 1.492(e)).

Claims	Number Filed	Number Extra	Rate	
Total Claims	13 - 20 =		X \$18.00	\$
Independent Claims	1 - 3 =		X \$84.00	\$
Multiple dependent claim(s) (if applicable)			+ \$280.00	\$ 280.00
<b>TOTAL OF ABOVE CALCULATIONS</b>				<del>\$ 890.00</del> 1170.00
Reduction by ½ for filing by small entity, if applicable.				
Verified Small Entity statement must also be filed. (Note 37 C.F.R. §§ 1.9, 1.27, 1.28)				-\$
<b>SUBTOTAL =</b>				<b>\$ 1170.00</b>
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. § 1.492(f)).				+\$
<b>TOTAL NATIONAL FEE =</b>				<b>\$ 1170.00</b>
Fee for recording the enclosed assignment (37 C.F.R. § 1.21(h)).				
The Assignment must be accompanied by an appropriate cover sheet				
(37 C.F.R. §§ 3.28, 3.31). \$40.00 per property				\$
<b>TOTAL FEES ENCLOSED =</b>				<b>\$ 1170.00</b>
Amount to be refunded				\$
Amount to be charged				\$

- a. ☒ A checks in the amounts of \$890.00 and \$280.00 to cover the above fees are enclosed.
- b. ☐ Please charge my Deposit Account No. 50-0310 in the amount of \$-0- to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ **Except** for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. § 1.16 and § 1.17 which may be required, or credit any overpayment to Deposit Account No. 50-0310.

  
 Robert J. Goodell  
 Reg. No. 41,040

December 28, 2001

Customer No. 09629

**SEND ALL CORRESPONDENCE TO:**

**Morgan, Lewis & Bockius LLP**

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PATENT  
ATTORNEY DOCKET NO. 041463-5030

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of: )  
Othmar BRÜHWILER )  
U.S. Application No.: Unassigned ) Group Art Unit: Unknown  
Filed: Concurrently Herewith ) Examiner: Unknown  
National Stage Application of PCT/CH00/00279 )  
For: APPARATUS FOR GENERATING )  
ELECTRICAL ENERGY (AS AMENDED))

Commisioner for Patents  
Washington, DC 20231

Sir:

**PRELIMINARY AMENDMENT**

Prior to the examination of the above-identified application on the merits, please amend  
the application as follows:

**IN THE TITLE:**

Please amend the title to read as follows:

APPARATUS FOR GENERATING ELECTRICAL ENERGY

**IN THE SPECIFICATION:**

Please amend the paragraph at page 1, lines 4-7 under the heading "Technical Field" to  
read as follows:

The present invention relates to an apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer located on the rotor and connected to the at least one coil.

Please amend the paragraph at page 1, line 9-12, under the heading "Prior Art" to read as the following three paragraphs:

In apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer, the at least one consumer is generally located on the stator side. The electrical energy generated in the rotor is thus transmitted to the fixed part by means of sliding contacts.

Patent Abstracts of Japan Vol. 008, No. 250 (E-279), 16th November 1984 (1984-11-16) and JP 59 1275566 A (Mobuo Kiyokawa) 23rd July 1984 (1984-07-23) disclose an apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer, wherein on the rotor there is located a diode bridge connected to the coil and connected to a further consumer. Where the further consumer is located and of what type it is cannot be inferred from the document.

DE 27 10 148 A (Voith Getriebe KG) 14th September 1978 (1978-09-14) discloses a blade rotor designed as a wind energy converter wherein electrical lights are located on the rotor. These should form a closed advertising space for the eye when the rotor turns sufficiently rapidly. The thus designed energy converter is provided with a generator which supplies the current for the lights. For further details refer to Lueger, Lexikon der Technik, 1965, Vol. 7,

pages 574-581. In this additional literature wind power plants are described where a separate generator with its own rotor is provided in each case in addition to the blade rotor. In this arrangement the current for the lights is transmitted from the generator rotor to the blade rotor.

Please amend the paragraphs at page 1, line 14, to page 2, line 6, under the heading "Description of the Invention" to read as the following three paragraphs:

The invention now proposes an apparatus of the type specified initially, wherein the at least one electrical consumer located on the rotor and there connected to the at least one coil is a light-emitting element and/or a non-luminous signal transmitter.

A particularly interesting and advantageous application of the invention is obtained if the apparatus is designed as a windmill and the rotor is provided with blades. The invention is particularly suited for this application because, as a result of the generation of electrical energy, sliding contacts between the rotor and the stator are dispensed with on the rotor and in addition a low running and starting resistance of the rotor can be achieved which is particularly important for a windmill.

If at least one light-emitting diode (LED) is used as the consumer on the rotor, this will light up as soon as the windmill begins to be turned by the wind. In particular, this can lead to attractive effects when a plurality of differently coloured light-emitting diodes are used on the blades of the windmill.

**IN THE CLAIMS:**

Please amend claims 1-2 and 5-11 to read as follows:

1. (Amended) An apparatus with generation of electrical energy, comprising:  
  
a rotor with at least one coil;  
  
a stator with at least one magnet and at least one electrical consumer located on the rotor  
and connected to the at least one coil,  
  
wherein the at least one consumer includes at least one of a light-emitting element and a  
nonluminous signal transmitter.
2. (Amended) The apparatus according to Claim 1, characterised in that it is  
designed as a windmill and the rotor is provided with blades.
5. (Amended) The apparatus according to Claim 1, characterised in that the at least  
one magnet is a permanent magnet.
6. (Amended) The apparatus according to Claim 1, characterised in that the at least  
one permanent magnet is mounted on a disk comprising magnetic material.
7. (Amended) The apparatus according to Claim 1, characterised in that several  
magnets are distributed uniformly around the circumference of the stator with respect to its axis  
and are preferably arranged with matching polarity (NNNN) relative to this axis.

8. (Amended) The apparatus according to Claim 1, characterised in that the at least one coil has an air gap winding or an iron-free winding.

9. (Amended) The apparatus according to Claim 1, characterised in that the at least one coil is mounted on a disk made from a magnetic material.

10. (Amended) The apparatus according to Claim 1, characterised in that the rotor is supported on a pin of the stator.

11. (Amended) The apparatus according to Claim 1, characterised in that several series-connected coils distributed uniformly over the circumference of the rotor are provided and that several consumers constructed as light-emitting diodes are connected to these coils such that a first of the consumers sees the voltage generated in series in at least two of the coils and a second consumer sees a voltage generated in series in at least one coil fewer.

**REMARKS**

Applicants respectfully request that the amendments be entered and considered prior to examination on the merits. Applicants respectfully provide the amendments to improve the form of the specification and claims. Moreover, Applicants respectfully submit that the amendments do not relate to any issue of patentability and do not narrow the scope of the claims. Further, Applicants respectfully submit that the amendments correspond to the amendments identified in the annexes to the International Preliminary Examination Report (IPER) in the PCT International Application of which this application is a national stage application, correct improper multiple dependent claims, or correct informalities. Accordingly, Applicants respectfully submit that the amendments do not introduce new matter. Thus, for at least these reasons, Applicant do not intend to relinquish any subject matter by these amendments.

**Conclusion**

The foregoing amendments are being made to place the application in condition for examination. A favorable action on the merits is respectfully solicited.

Attached hereto is a marked-up version of the changes made by the current amendment. The attachment is captioned "Version with markings to show changes made."

If there are any other fees due in connection with the filing of this paper, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under



37 C.R.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully Submitted,

By: RAQJL  
Robert J. Goodell  
Reg. No. 41,040

Dated: Dec 28, 2001

MORGAN, LEWIS & BOCKIUS LLP  
1800 M Street, N.W.  
Washington, DC 20036  
202-467-7549 (Phone)  
202-467-7258 (Fax)

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE TITLE:**

Please amend the title as follows:

~~[WINDMILL WITH ILLUMINATED BLADES AND GENERATION OF]~~  
APPARATUS FOR GENERATING ELECTRICAL ENERGY

**IN THE SPECIFICATION:**

Please amend the paragraph at page 1, lines 4-7 under the heading "Technical Field" as follows:

The present invention relates to an apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer located on the rotor and connected to the at least one coil.

Please amend the paragraph at page 1, line 9-12, under the heading "Prior Art" as the following three paragraphs:

In apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer, the at least one

~~[Apparatuses of this type are known wherein the]~~ consumer is generally located on the stator side. The electrical energy generated in the rotor is thus transmitted to the fixed part by means of sliding contacts.

Patent Abstracts of Japan Vol. 008, No. 250 (E-279), 16th November 1984 (1984-11-16)  
and JP 59 1275566 A (Mobuo Kiyokawa) 23rd July 1984 (1984-07-23) disclose an apparatus  
with generation of electrical energy, comprising a rotor with at least one coil, a stator with at  
least one magnet and at least one electrical consumer, wherein on the rotor there is located a  
diode bridge connected to the coil and connected to a further consumer. Where the further  
consumer is located and of what type it is cannot be inferred from the document.

DE 27 10 148 A (Voith Getriebe KG) 14th September 1978 (1978-09-14) discloses a  
blade rotor designed as a wind energy converter wherein electrical lights are located on the rotor.  
These should form a closed advertising space for the eye when the rotor turns sufficiently  
rapidly. The thus designed energy converter is provided with a generator which supplies the  
current for the lights. For further details refer to Lueger, Lexikon der Technik, 1965, Vol. 7,  
pages 574-581. In this additional literature wind power plants are described where a separate  
generator with its own rotor is provided in each case in addition to the blade rotor. In this  
arrangement the current for the lights is transmitted from the generator rotor to the blade rotor.

Please amend the paragraphs at page 1, line 14, to page 2, line 6, under the heading  
“Description of the Invention” to read as the following three paragraphs:

The invention now proposes an apparatus of the ~~[same type]~~ type specified initially,  
wherein ~~[however]~~ the at least one electrical consumer ~~[is]~~ located on the rotor and ~~[is]~~ there  
connected to the at least one coil is a light-emitting element and/or a non-luminous signal  
transmitter.

A particularly interesting and advantageous application of the invention is obtained if the apparatus is ~~[constructed]~~ designed as a windmill and the rotor is provided with blades. The invention is particularly suited ~~[to]~~ for this application because, as a result of the generation of electrical energy, sliding contacts between the rotor and the stator ~~[can be]~~ are dispensed with on the rotor and in addition a low running and starting resistance of the rotor can be achieved ~~[;]~~ which is ~~[of particular importance]~~ particularly important for a windmill.

If at least one light-emitting diode (LED) is used as the consumer on the rotor, this will light up as soon as the windmill begins to be turned by the wind. In particular, this can lead to attractive effects when a plurality of differently coloured light-emitting diodes are used on the blades of the windmill.

#### **IN THE CLAIMS:**

Please amend claims 1, 2, and 5-11 as follows:

1. (Amended) An apparatus ~~[for generating]~~ with generation of electrical energy, comprising:

a rotor ~~[(20)]~~ with at least one coil ~~[(22)]~~;

a stator ~~[(10)]~~ with at least one magnet ~~[(11)]~~ and at least one electrical consumer ~~[(23)]~~ characterised in that the at least one electrical consumer is located on the rotor and ~~[is]~~ connected to the at least one coil,

wherein the at least one consumer includes at least one of a light-emitting element and a nonluminous signal transmitter.

2. (Amended) The apparatus according to Claim 1, characterised in that it is designed as a windmill and the rotor is provided with blades [(21)].
5. (Amended) The apparatus according to [~~one of Claims 1—4~~] Claim 1, characterised in that the at least one magnet is a permanent magnet.
6. (Amended) The apparatus according to [~~one of Claims 1—5~~] Claim 1, characterised in that the at least one permanent magnet is mounted on a disk [(13)] comprising magnetic material.
7. (Amended) The apparatus according to [~~one of Claims 1—6~~] Claim 1, characterised in that several magnets are distributed uniformly around the circumference of the stator with respect to its axis and are preferably arranged with matching polarity (NNNN) relative to this axis.
8. (Amended) The apparatus according to [~~one of Claims 1—5~~] Claim 1, characterised in that the at least one coil has an air gap winding or an iron-free winding.

9. (Amended) The apparatus according to [~~one of Claims 1—9~~] Claim 1,  
characterised in that the at least one coil is mounted on a disk made from a magnetic material  
[(25)].

10. (Amended) The apparatus according to [~~one of Claims 1—9~~] Claim 1,  
characterised in that the rotor is supported on a pin [(12)] of the stator.

11. (Amended) The apparatus according to [~~one of Claims 1—10~~] Claim 1,  
characterised in that several series-connected coils [(A—D)] distributed uniformly over the  
circumference of the rotor are provided and that several consumers [(a—d)] constructed as light-  
emitting diodes are connected to these coils such that a first of the consumers [(e.g. a)] sees the  
voltage generated in series in at least two of the coils [(e.g. A—D)] and a second consumer [(e.g.  
b)] sees a voltage generated in series in at least one coil fewer [(e.g. B—D)].

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DESCRIPTION

TITLE

Apparatus for generating electrical energy

TECHNICAL FIELD

The present invention relates to an apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer located on the rotor and connected to the at least one coil.

PRIOR ART

In apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer, the at least one consumer is generally located on the stator side. The electrical energy generated in the rotor is thus transmitted to the fixed part by means of sliding contacts.

Patent Abstracts of Japan Vol. 008, No. 250 (E-279), 16th November 1984 (1984-11-16) and JP 59 1275566 A (Mobuo Kiyokawa) 23rd July 1984 (1984-07-23) disclose an apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer, wherein on the rotor there is located a diode bridge connected to the coil and connected to a further consumer. Where the further consumer is located and of what type it is cannot be inferred from the document.

DE 27 10 148 A (Voith Getriebe KG) 14th September 1978 (1978-09-14) discloses a blade rotor designed as a wind energy converter wherein electrical lights are located on the rotor. These should form a closed advertising

space for the eye when the rotor turns sufficiently rapidly. The thus designed energy converter is provided with a generator which supplies the current for the lights. For further details refer to Lueger, Lexikon der Technik, 1965, Vol. 7, pages 574-581. In this additional literature wind power plants are described where a separate generator with its own rotor is provided in each case in addition to the blade rotor. In this arrangement the current for the lights is transmitted from the generator rotor to the blade rotor.

#### DESCRIPTION OF THE INVENTION

The invention now proposes an apparatus of the type specified initially, wherein the at least one electrical consumer located on the rotor and there connected to the at least one coil is a light-emitting element and/on a non-luminous signal transmitter.

A particularly interesting and advantageous application of the invention is obtained if the apparatus is designed as a windmill and the rotor is provided with blades. The invention is particularly suited for this application because, as a result of the generation of electrical energy, sliding contacts between the rotor and the stator are dispensed with on the rotor and in addition a low running and starting resistance of the rotor can be achieved which is particularly important for a windmill.

If at least one light-emitting diode (LED) is used as the consumer on the rotor, this will light up as soon as the windmill begins to be turned by the wind. In particular, this can lead to attractive effects when a plurality of differently coloured light-emitting diodes are used on the blades of the windmill.



NEW CLAIM 1

1. An apparatus with generation of electrical energy, comprising a rotor (20) with at least one coil (22), a stator (10) with at least one magnet (11) and at least one electrical consumer (23) located on the rotor and connected to the at least one coil, characterised in that the at least one consumer comprises a light-emitting element and/or a nonluminous signal transmitter.

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WINDMILL WITH ILLUMINATED BLADES AND GENERATION OF  
ELECTRICAL ENERGY

TECHNICAL FIELD

The present invention relates to an apparatus with generation of electrical energy, comprising a rotor with at least one coil, a stator with at least one magnet and at least one electrical consumer.

PRIOR ART

Apparatuses of this type are known wherein the consumer is generally located on the stator side. The electrical energy generated in the rotor is thus transmitted to the fixed part by means of sliding contacts.

DESCRIPTION OF THE INVENTION

The invention now proposes an apparatus of the same type wherein however the electrical consumer is located on the rotor and is there connected to the at least one coil.

A particularly interesting and advantageous application of the invention is obtained if the apparatus is constructed as a windmill and the rotor is provided with blades. The invention is particularly suited to this application because, as a result of the generation of electrical energy, sliding contacts between rotor and stator can be dispensed with on the rotor and in addition a low running and starting resistance of the rotor can be achieved, which is of particular importance for a windmill.

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If at least one light-emitting diode (LED) is used as the consumer on the rotor, this will light up as soon as the windmill begins to be turned by the wind. In particular, this can lead to attractive effects when a plurality of differently coloured light-emitting diodes are used on the blades of the windmill.

Advantageous and therefore preferred embodiments and further developments of the invention are characterised in the dependent claims.

#### BRIEF EXPLANATION OF THE DRAWINGS

The invention will be explained in detail hereinafter with reference to examples of embodiment in connection with the drawings, wherein the examples relate to an apparatus according to the invention constructed as a windmill, where

Fig. 1 is a perspective exploded view of a windmill according to the invention cut in half;

Fig. 2 a) is a top view of the mounting surface of the stator provided with a corresponding number of permanent magnets and bordering on the said gap and b) is a sectional view of the magnets and an appropriate mounting plate (section 2-2 in view a));

Fig. 3 a) is a top view of the mounting surface of the rotor provided with several coils and bordering on the gap between rotor and stator and b) is a sectional view of the magnets and an appropriate mounting plate (section 3-3 in view a));

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Fig. 4 is a preferred wiring of the rotor coil with several light-emitting diodes; and

Fig. 5 is a schematic view of the rotor of the windmill with a plurality of light-emitting diodes.

#### WAYS OF IMPLEMENTING THE INVENTION

The apparatus in Fig. 1 is a windmill of a handy size such as can be installed, for example, for decorative purposes in the garden of a house, on a balcony or in a similar location.

The windmill in Fig. 1 comprises a stator 10 and a rotor 20 provided with blades 21. The stator has means 14 for its attachment to a stay-bar or similar. The parts shown between the stator 10 and the rotor 20 belong to the stator 10 and comprise four axially-magnetised permanent magnets 11 which are arranged such that they are distributed uniformly around the rotor or stator axis, as shown in Fig. 2. On the rotor 20 are provided four coils 22 corresponding to the number of permanent magnets 11, which like the permanent magnets 11 are also arranged uniformly around the rotor or stator axis and at the same distance therefrom. This is shown in Fig. 3. On the blades 21 of the rotor 20 there are located light-emitting diodes (LEDs) 23 wherein here only one such light-emitting diode is shown per blade. The light-emitting diodes 23 are electrically connected to the coils 22. The rotor 20 is supported on an axial bearing pin 12 of the stator 10, which engages in an axial bearing hole 24 in the rotor 20.

When the rotor 20 turns, for example, as a result of being driven by the wind, an alternating voltage is induced in the coils 22 of the rotor 20 as said coils move past the permanent magnets 11 of the stator 10 and

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are thereby exposed to an alternating magnetic field. This results in a voltage at the light-emitting diodes 23 as the electrical consumer, which makes these light up when a threshold voltage of typically 2 V - 2.5 V is reached. Since this voltage or the appropriate current is generated directly in the rotor 20 on which the light-emitting diodes 23 are located as consumers, there is no need to transmit the current from the stator 10 to the rotor 20 via sliding contacts (slip rings) which would bring about an additional turning resistance for the rotor 20. The rotor 20 can thus advantageously be moved even by relatively gentle wind.

In order to avoid cogging moments and thereby further facilitate starting of the windmill at low wind strengths, the coils 22 are preferably implemented with an air-gap winding or an iron-free winding. They can be self-supporting coils e.g. so-called backlag coils.

The magnets 11 are preferably mounted on a disk of magnetic material, especially an iron disk as shown in Fig. 1 and denoted by 13. By this means the flux guidance is improved, i.e., a higher magnetic flux is obtained in the coils 22.

If the magnets 11, as is preferred, all have the same polarisation relative to the direction of the axis, e.g. NNNN as shown in Fig. 2, and there are gaps between them as also shown in Fig. 2, a field having an opposite direction of flux forms between the magnets, as is indicated by SSSS in Fig. 2. Thus, with a given number of magnets it is possible to construct a generator with twice as many poles. In the case with four magnets taken as an example, a generator with eight poles is thus obtained. This is therefore advantageous because as a result of a large number of poles a sufficiently high voltage to operate the light-

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emitting diodes 23 can be achieved even at low speed. The voltage is namely proportional to the number of poles in addition to the speed. Additionally savings on magnets are hereby made.

If, as is further preferred, the coils 22 on the rotor 20 are also mounted on a disk made of a magnetic material, again especially iron sheet, the magnets 11 arranged on the stator exert an attractive force on the rotor 20 in the axial direction. A corresponding iron sheet is denoted by 25 in Fig. 1. As a result of said force, the rotor 20 does not need to be attached on the bearing pin 12 of the stator in the axial direction. It is sufficient to simply press it onto the bearing pin where it is then held axially by the magnetic forces. This is especially advantageous with respect to the possibility that the stator 10 and rotor 20 can be simply joined together or separated one from the other and thus, for example can be packaged separately one from the other and dispatched. The axial attraction between stator and rotor can be adjusted precisely and simply by varying the thickness and the spacing of the disk 25.

The light-emitting diodes 23 are used simultaneously as rectifier elements and lighting elements. In this respect it is preferable to arrange two light-emitting diodes always in pairs and anti-parallel one to the other in order to utilise both half-waves of the alternating voltage.

As already mentioned, the voltage induced in the coils 22 of the rotor 20 is proportional to the rotor speed. In order to ensure, on the one hand, that the light-emitting diodes light up even in only gentle wind and at only a low rotor speed but, on the other hand, to avoid the current being too high above the failure

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limit of the light-emitting diodes in very strong wind and at correspondingly high speed, voltage stabilisation can be used.

In order to avoid voltage stabilisation, the dimensions can be selected so that the current through the light-emitting diodes themselves does not exceed the maximum permissible value even at the highest predicted speed.

Figure 4 shows an arrangement with four pairs of light-emitting diodes a-d connected anti-parallel to one another for which voltage stabilisation is also not required. In this arrangement four coils A, B, C and C are connected in series in this order. Only the pair of diodes d is connected in parallel with the coil D. The pair c is in parallel with the two coils C and D. The pair b is in parallel with the three coils B - D and finally the pair a is allocated to all four coils A - D.

The arrangement in Fig. 4 has the advantage that as the speed increases, the current is distributed to increasingly more pairs of diodes and is thereby somewhat stabilised. Thus, initially only the pair of diodes a which sees the voltage from all four coils A - D begins to light up. As the speed increases, the other pairs of diodes b, c and d are then added one after the other. The current through the individual light-emitting diodes thus remains substantially constant over a wide operating range.

The arrangement in Fig. 4 also has the advantage that as a result of the dependence of the number of burning light-emitting diodes on the speed, on the one hand an interesting optical effect is obtained and on the other hand, the speed of the windmill can be identified and

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read off by the observer which allows conclusions to be drawn on the force of the wind driving the windmill.

Figure 5 shows a possible design of the rotor 20 in a front view wherein respectively several light-emitting diodes 23 are arranged radially spaced on the blades 21 of the rotor. These could, for example, also be differently coloured. If the light-emitting diodes are also wired as in Fig. 4, they could be arranged for example such that as the speed increases, they begin to light up from the inside to the outside or conversely.

The design of the apparatus according to the invention described above as an illuminated windmill is only an example. Other realisations are fundamentally also feasible. Another very interesting possibility is, for example, a corresponding illumination of vehicle wheels, especially bicycles, motorcycles, prams, inline-skates or similar, wherein the illumination then also has a safety aspect. The number and size of the coils and magnets is within certain limits arbitrary. Especially, Fig. 4 can be extended to further coils and consumers. The coils and the magnets can have different shapes and sizes. Especially suitable for the magnets are flat or disk shapes with rectangular or round cross-sections. On account of their strength, neodymium magnets are particularly advantageous. In addition to light-emitting diodes, other light-emitting elements such as incandescent lamps, halogen lamps or light-emitting polymers can also be considered as consumers. Non-luminous signal transmitters, e.g. those of an acoustic nature could fundamentally also be used. Here it can be envisaged that a melody or similar is produced during a revolution.

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CLAIMS

1. An apparatus for generating electrical energy, comprising a rotor (20) with at least one coil (22), stator (10) with at least one magnet (11) and at least one electrical consumer (23), characterised in that the at least one electrical consumer is located on the rotor and is connected to the at least one coil.
2. The apparatus according to Claim 1, characterised in that it is designed as a windmill and the rotor is provided with blades (21).
3. The apparatus according to Claim 1 or 2, characterised in that at least one light-emitting diode (LED) is used as the consumer.
4. The apparatus according to Claim 3, characterised in that at least two light-emitting diodes are connected anti-parallel to one another.
5. The apparatus according to one of Claims 1 - 4, characterised in that the at least one magnet is a permanent magnet.
6. The apparatus according to one of Claims 1 - 5, characterised in that the at least one permanent magnet is mounted on a disk (13) comprising magnetic material.
7. The apparatus according to one of Claims 1 - 6, characterised in that several magnets are distributed uniformly around the circumference of the stator with respect to its axis and are preferably arranged with matching polarity (NNNN) relative to this axis.

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8. The apparatus according to one of Claims 1 - 5, characterised in that the at least one coil has an air gap winding or an iron-free winding.
9. The apparatus according to one of Claims 1 - 9, characterised in that the at least one coil is mounted on a disk made from a magnetic material (25).
10. The apparatus according to one of Claims 1 - 9, characterised in that the rotor is supported on a pin (12) of the stator.
11. The apparatus according to one of Claims 1 - 10, characterised in that several series-connected coils (A-D) distributed uniformly over the circumference of the rotor are provided and that several consumers (a-d) constructed as light-emitting diodes are connected to these coils such that a first of the consumers (e.g. a) sees the voltage generated in series in at least two of the coils (e.g. A - D) and a second consumer (e.g. b) sees a voltage generated in series in at least one coil fewer (e.g. B - D).

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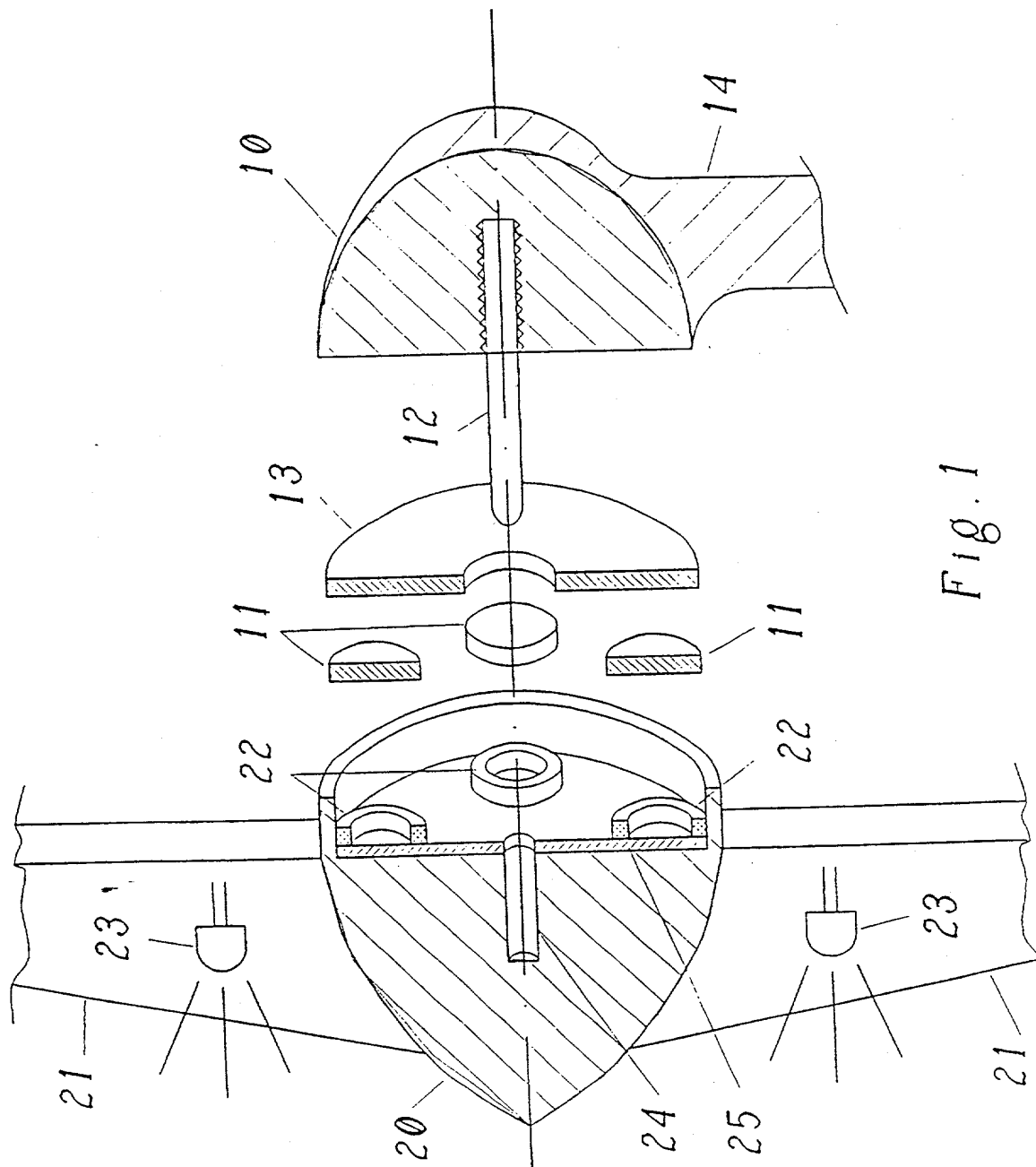


Fig. 2

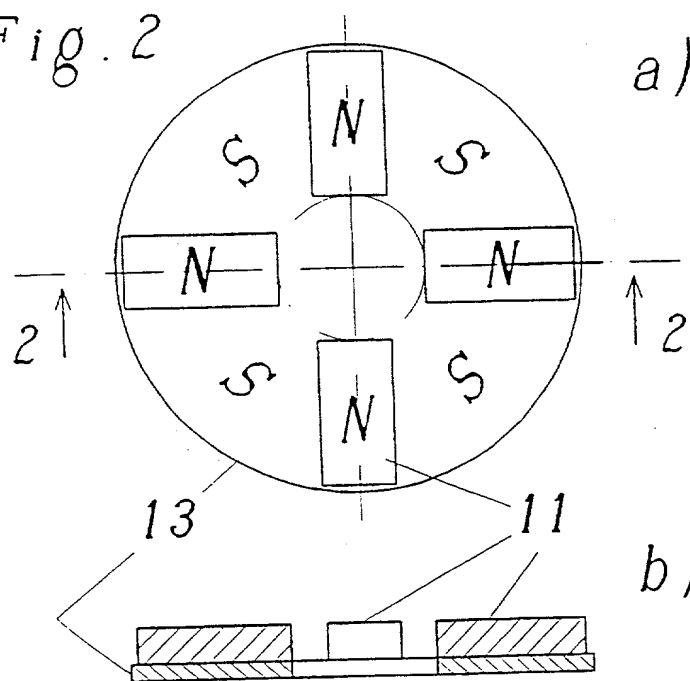
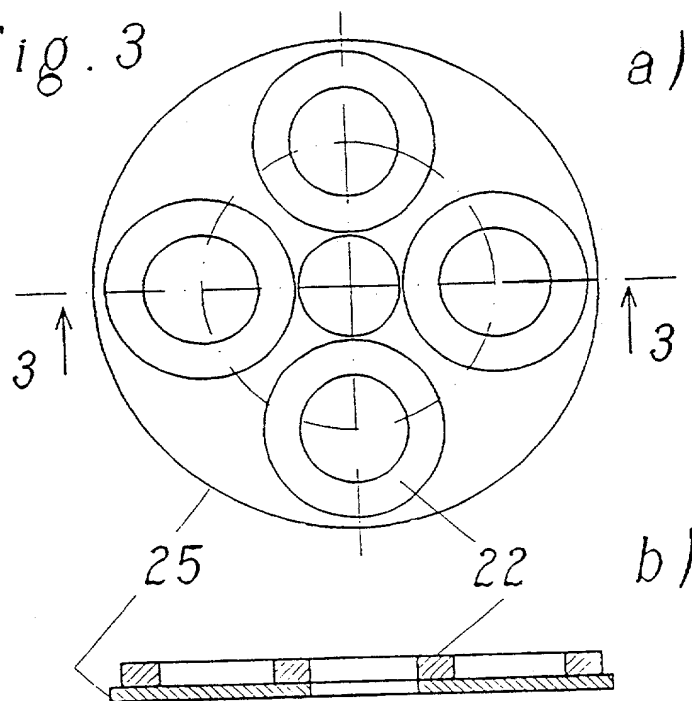


Fig. 3



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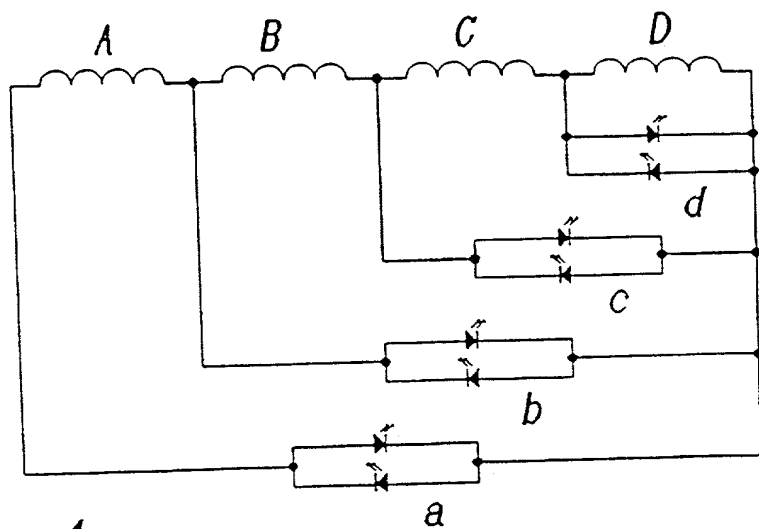


Fig. 4

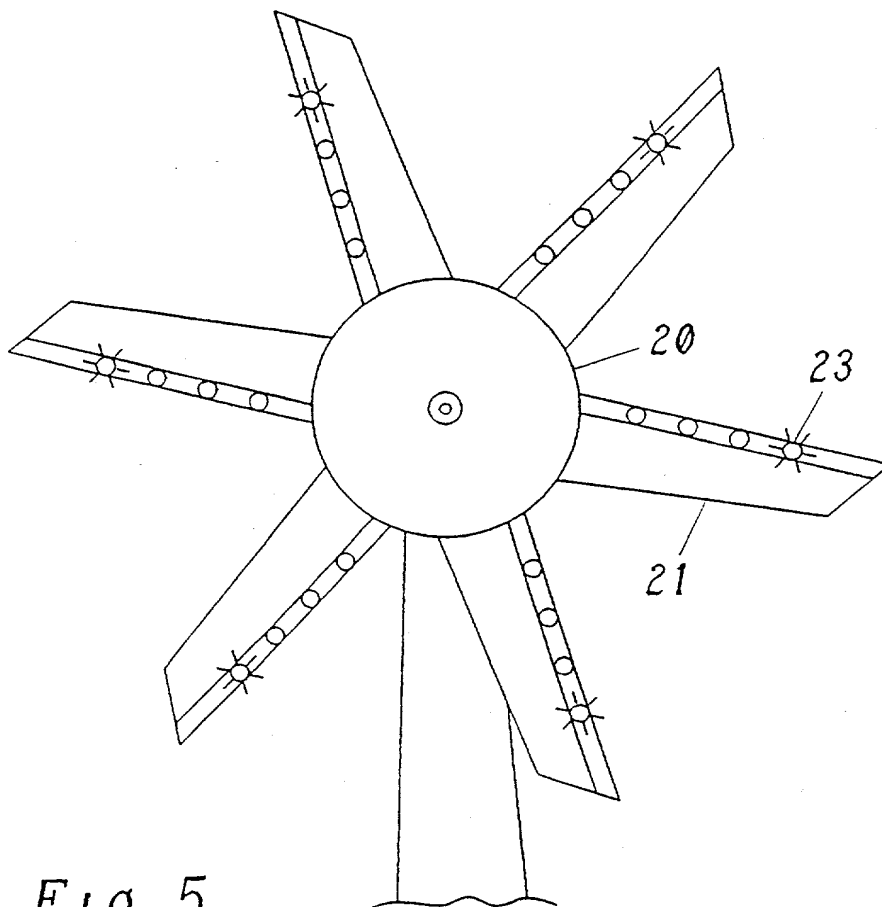
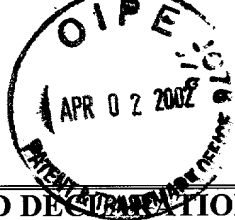


Fig. 5

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# COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

U.S. DEPARTMENT OF COMMERCE

Patent and Trademark Office

ATTORNEY DOCKET NO.: 041463-5030

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

## WINDMILL WITH ILLUMINATED BLADES AND GENERATION OF ELECTRICAL ENERGY

The specification of which:

is attached hereto; or

was filed as United States application Serial No. \_\_\_\_\_ on \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable); or

was filed as PCT international application Number PCT/CH00/00279 on May 19, 2000 and was amended under PCT Article 19 On \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent and Trademark Office information which is material to the patentability of claims presented in this application in accordance with Title 37, Code of Federal Regulations Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate or Section 365(a) of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign applications(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

### PRIOR FOREIGN APPLICATION(S):

COUNTRY (if PCT, indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED
Switzerland	CH 1202/99	29 June 1999	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

Combined Declaration for Patent Application and Power of Attorney - (Continued)  
(includes Reference to PCT International Applications)  
ATTORNEY DOCKET NO.: 041463-5030

I hereby claim the benefits under Title 35, United States Code Section 119(e) of any United States provisional application(s) listed below.

U.S. PROVISIONAL APPLICATIONS

U.S. PROVISIONAL APPLICATION NO.

U.S. FILING DATE:

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) or Section 365(c) of any PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to the patentability of claims presented in this application in accordance with Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT:

U.S. OR PCT INTERNATIONAL APPLICATIONS		STATUS (Check One)		
APPLICATION NO.	FILING DATE	PATENTED	PENDING	ABANDONED
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

POWER OF ATTORNEY: As a named inventor, I hereby appoint the registered practitioners of Morgan, Lewis & Bockius LLP included in the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to that Customer Number.

Customer Number: **09629**

Direct Telephone Calls To:

**Robert J. Gaybrick**  
**202-467-7501**

Combined Declaration for Patent Application and Power of Attorney - (Continued)  
(includes Reference to PCT International Applications)  
ATTORNEY DOCKET NO.: 041463-5030

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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POST OFFICE ADDRESS		
THIRD INVENTOR'S SIGNATURE	DATE	

Listing of Inventors Continued on attached page(s): ☐ Yes ☒ No

20040114-04002